Development of Appropriate Project Management Factors for the Construction Industry in Kenya

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***Abstract** - The construction industry is a crucial sector for the growth of any economy. It is the sector involved with erection, repair and demolition of buildings and Civil Engineering structures in an economy (Hillebrandt, 2000). According to the Kenya National Bureau of statistics (KNBS; 2012) the construction industry contributed 3.8%, 4.1 %, 4.3% and 4.1 % towards Gross Domestic Product (GDP) for the years 2008, 2009, 2010 and 2011 respectively. This is an average of 4.1 % as compared to 10% for the developed economies (Hillebrandt, 2000).*

Project management was introduced as a solution to the perennial problems of cost, time and quality in execution of construction projects. But the much touted benefits are not always achieved leaving clients with a lot of disappointments. It can be argued that the traditional project management variables have been inadequate in the assessment and control of construction projects. This paper set out to develop the most appropriate project management variables for Kenya to enable achieve an efficient and effective construction industry.

A survey approach covering a sample of 500 members; randomly selected from the population was utilized.

Keywords: Project Management Variables, Lagging Measures, Leading Measures, Project Success, Project Management Models.

I. INTRODUCTION

In the last three decades, construction research in Kenya has focused on the entities that constitute the construction industry – particularly the projects, the contractors and human resources- deducing the performance of the industry as a whole from the observations made on its parts. Key areas of research have been procurement methods (Mbaya 1984, Kithinji, 1988 and Mbatha 1993); project execution – cost overrun & time overruns and construction resources (Wachira 1996, Talukhaba 1999, Gichunge 2000, Wanyona, 2005, Masu 2006 and, Muchungu, 2012) and indigenous contractors and marketing (Magare; 1987 and Gitangi, 1992). It is evident that construction projects in Kenya are supervised by very qualified human resources; who end up failing; an example is the extension by two floors of the school of Built environment building at the University of Nairobi which was supervised by Professors teaching at the same school.

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The project initially meant to take one year dragged on for 10 years with cost overruns (Muchungu,2012). There is need therefore to relook at construction projects performance with a view of identifying the right success measures for appropriate application.

II. CLIENT SATISFACTION MEASURES

The inability of the construction industry to consistently satisfy its clients is a major concern. One way to overcome this problem is to adopt new approaches and techniques to increase the efficiency and client satisfaction. The possibility of improving client's satisfaction is by meeting his needs. According to Love (1996), there are several factors that contribute to client dissatisfaction, they include the following:

- Project not completed on time nor in budget
- Project not completed according to the required technical specification and quality
- Lack of feedback from participants
- Lack of involvement throughout the project

The Latham Report (1994) reviewed procurement and contractual arrangements in the construction industry and gave emphasis to the importance of clients, good briefing and the essential need to the experts and professions and industry in a team approach to satisfy client requirements. Research by Atkinson (1999) identified the need for clients and their advisors to be aware of the importance of decision making (business case, development of the design and management of the project) at the strategic level.

Davenport and Smith (1995) examined the relative level of client satisfaction and involvement with all of procurement types. They concluded that it was more difficult to satisfy private clients than public ones; however, they did not give evidence to the reasons of whether it was that public clients have more understanding of the capability of contractors than private contractors and therefore find satisfaction more easily. Table 1.1 presents reports from different authors on the measures of client satisfaction.

Table 1.1 Client Satisfaction Measures

Author	Measure of Satisfaction
Walker 1994	Quality, cost and time
Bitici 1994	Quality, reliability, on time deliveries, high service levels and minimum cost of ownership
Kometa 1994	Function, safety, economy, running costs, flexibility, time and quality
Harvey and Ashworth 1997	Trust, cost, performance and management
Chinyio et al 1998	Economy, functionality, quality, timeliness, lack of surprise and safety

Source: Own compilation, 2013

It can be seen from table 1.1 stated definitions that time, cost and quality (Walker 1994), are not the only measures of client satisfaction, but they also expand to include other factors such as working relationships and other factors which are people related factors such as stakeholders and business partners.

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With such considerable evidence linking people's relationships cannot be ignored as a main contributor to client satisfaction.

III. CRITERIA FOR ASSESSING PROJECT PERFORMANCE BASED ON EXISTING PROJECT MANAGEMENT MODELS

The criteria in which project success/failure has often been assessed have also been called key performance indicators and even dimensions (Atkinson, 1999, Shenhar et al, 2002, Betham et al., 2004; Chan and Chan, 2004;). Several authors, within the multidimensional construct of project performance have proposed different criteria or indicators based on empirical research. While some focused on using these measures as strategic weapons, others emphasized the proper delineation of the measures and groupings into classes that will make tracking and management reasonable. Shenhar et al's (1996, 1997) model is based on the principle that projects are undertaken to achieve business results and that they must be "perceived as powerful strategic weapons, initiated to create economic value and competitive advantage, and project managers must become the new strategic leaders, who must take responsibility for project business results.". In their opinion, "projects in future will no longer be just operational tools for executing strategy –they will become the engines that drive strategy into new directions." The second premise is about the existence of project typologies, on the slogan "one size does not fit all". They propose that project success should be considered in four dimensions: *project efficiency, Impact on the customer, Business success, and Preparing for the future.* These are to be assessed on the basis of four project types: *Low-tech, Medium-tech, High-tech, and Super-high tech projects.*

Vandevelde et al. (2002) summarized various works on project performance measurement which are based on the multidimensional, multi-criteria concept. In all, they identified seven dimensions: *respect for time, respect for budget and technical specification, knowledge creation and transfer, contribution to business success, financial and commercial success*. They merged these seven dimensioned model into a **three-polar model** namely, *process, economic and indirect poles***.** Atkinson (1999) separates success criteria into *delivery* and *post-delivery* stages and provides a "square route" to understanding success criteria*: iron triangle, information system, benefits (organizational) and benefit* (stakeholder community). The 'iron triangle', has *cost, time* and *quality* as its criteria (for the delivery stage). The post-delivery stages comprise:

(i) The Information system, with such criteria as maintainability, reliability, validity, information quality use;
(ii) Benefit (organizational): improved efficiency, improved effectiveness, increased profits, strategic goals, organizational learning and reduced waste;
(iii) Benefit (Stakeholder community): satisfied users, Social and Environmental impact, personal development, professional learning, contractor's profits, capital suppliers, confident project team and economic impact to surrounding community.

This model takes into consideration the entire project lifecycle and even beyond. It thus lends itself for continuous assessment. Lim and Mohamed (1999), as reviewed by Chan and Chan, (2004), modelled project success measurement into '**micro viewpoint:** *completion time, completion cost, completion quality, completion performance, completion safety;* and **macro-viewp**oints: *completion time, completion satisfaction, completion utility, completion operation*. A key feature of this model is that it proposes only lagging indicators and gives no room for continuous assessment and monitoring. Below each view point are list of "factors" for measurement. Chan and Chan (2004) concentrated on construction projects, and, based on previous works (particularly of Shenhar et al 1997; Atkinson, 1999; and Lim and Mohamed, 1999), proposed a 15 key project indicators, key performance indicators (KPIs), comprising both objective measures: *construction time, speed of construction, time variation, unit cost, percentage net variation over final cost, net present value, accident rate, Environmental Impact Assessment (EIA) scores;* and subjective measures: *quality, functionality, end-user's satisfaction, client's satisfaction, design team's satisfaction, construction team's satisfaction.*

Patanakul and Milosevic (2009) grouped their measurement criteria into three:

(i) criteria from organizational perspective: *Resource productivity, Organizational learning*
(ii) criteria from project perspective: *time-to-market, Customer satisfaction* and
(iii) criteria from personal perspective: *personal growth, personal satisfaction*.

Sadeh et al (2000) proposed a division of project success into four dimensions. These are: *Meeting design goals, benefit to end user, benefit to the development organization, benefit to the defence and national infrastructure*, in that order. Finally, Freeman and Beale (1992) provided *technical success, efficiency of project execution, managerial and organizational success, personal growth, completeness, and technical innovation* as the main success criteria. In effect, these authors are emphasizing the need to strategically assess project in dimensions that will facilitate its management for good performance. Taking from the often quoted adage of performance management: "if you cannot measure, you cannot manage", it is also true that: if you cannot measure appropriately, you cannot manage appropriately.

IV. PROBLEMS WITH EXISTING PROJECT MANAGEMENT MODELS

Despite the existence of several project management models meant to ensure improvements in project performance, several authors have found some short comings with them and expressed the doubt whether the true objective of assessment would be achieved. This has got to do with the measures in use, the paradigm within which they are being considered, and the nature of the models.

A. The Problems With The Success/Failure Definition

A major problem found with the present paradigms of project performance measurement is the lack of consensus on what constitutes success or failure of the project. Various authors have expressed concern about the definition of success and failure. Quoting from Morris and Hough (1996), Murray et al, (2002) indicate that the definition of a success or failure of a project is not always an easy one. Project management theories have not always agreed on a universal definition of what is meant by a project success (Shenhar et al, 2002). Consequently, the factors causing success (or failure) have

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been similarly defined in restricted dimensions by various authors. Murray et al (2002) notes from literature that projects are often termed a technical success despite being behind schedule and over budget. Conversely, projects may be ahead of schedule and within budget but still be a technical failure. This position is corroborated by Willard (2005) who provided examples showing the various means by which success have been declared. Within a certain context, Ludin and Söderholm (1995) comment that a project could be considered a success in the sense that it has successfully passed through all the sequences of the standard stage: *concepts, development, implementation and termination.* Notably, Murray et al (2002) reiterated Morris and Hough's (1987) discussion as to whether one should study project successes and failure. "To some extent", they conclude, "it would seem that Murphy's Law is at work: *'what can go wrong will go wrong'* ".

In their contribution, Klakegg et al (2005) acknowledge this lack of consensus on what success is and how to measure it as a fundamental but often unresolved issue in investment projects. They opined that "success is to apply the right amount of resources to do the right things at the right time". Significantly, they admit that what the right thing may be, for government projects, is for the decision makers to agree, and should reflect relevant needs in society as expressed for instance in public international agreements. One of the results of this disagreement is the inherent assumption that the two are dichotomous. That a project either ends up successfully or it failed.

B.Project Success and Failure Considered Within the "Two-Factor" Theory

One of the causes of the difficulty in reaching consensus on the definition of project success or failure lies in the fact that these two have been treated as a dichotomy. This research takes the view that the two are not mutually exclusive and that they could, in fact, exist together across the stages of the project life cycle. Also called the 'Hertzberg's Hygiene-motivation' factor, the 'Two-factor' theory can be used to explain the relationship between project success and failure from the point of view of their underlying factors. Proposed by Hertzberg et al. in 1959, this theory indicates that the factors leading to 'satisfaction' are separate and distinct from the factors that lead to 'dissatisfaction'. Hence satisfaction and dissatisfaction can exist independently and simultaneously so long as the factors producing them exist. It postulates that the opposite of "Satisfaction" is not "Dissatisfaction" but "No Satisfaction", and the opposite of "Dissatisfaction" is not "Satisfaction" but "No Dissatisfaction" (Robbins, 2005). Applying this theory to the project situation then puts the success and failure question into a dual continuum, rather than a dichotomous, situation. We can speak of "success", "no success", "failure" and no "failure" of aspect of a typical project within the phases of its life cycle based on the influencing factors. With regard to the influencing factors, De Wit (1988) posits thus: "factors affecting project success or failure are usually good indicators of preconditions of success or failure". He considered them to be analogous to Hertzberg's hygiene/ motivation factors in that the presence of success factors does not guarantee success but not identifying them (their absence) is likely to lead to failure. Therefore in the project situation, the factors that lead to success could, sometimes, be separate and distinct from the factors that lead to failure that is the absence of those success factors should not always be seen as the only causes of failure. Hence there could be a condition for a project in which assessment will result in "no success" without necessarily implying "failure". In practice, this is realized by using multi-measures to assess projects. In such a situation a project could fail in some criteria but perform very well in others. In assessing a construction project thus, a fundamental theory to embrace is that the absence of success does not necessarily indicate a failure and vice versa. This position is explained by considering the various interest groups (stakeholders) within a typical construction project with diverse focus, expectations and what is of essence to them across the project lifecycle.

V. METHODOLOGY

A sample size of 500members randomly selected was utilized in this research. The response rate by the various respondents who participated in the research indicated an overall percentage of 62.4% or 312 members which was satisfactory to provide necessary information for the analysis.

Data analysis was carried out using descriptive statistics. ANOVA was used to compare the two sets of variables using F-test and results compared. Principal Components Analysis was used as a factor reduction tool and later to establish the most appropriate project management factors.

Table 1.2: Total Variance explained on the Key management factors for project management

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.239	38.534	38.534	4.239	38.534	38.534	3.315	30.135	30.135
2	1.524	13.856	52.390	1.524	13.856	52.390	2.343	21.300	51.435
3	1.270	11.544	63.934	1.270	11.544	63.934	1.375	12.499	63.934
4	.969	8.806	72.740						
5	.737	6.701	79.441						
6	.626	5.691	85.132						
7	.475	4.319	89.451						
8	.359	3.265	92.716						
9	.304	2.761	95.477						
10	.282	2.560	98.037						
11	.216	1.963	100.000						

VI. DATA PRESENTATION AND ANALYSIS OF RESULTS

A. Key Management Factors For Project Management Analyzed Through The PCA Method.

Key management factors of the project management for the various respondents' were analyzed through the Principal Component Analysis (PCA) method. The data for all the respondents' is as shown in table 1.2.

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Kaiser-Meyer-Olkin Adequacy Measure (KMO): 0.787
Cronbach's Alpha 0.861 Rotation method: Varimax

Source: Field survey 2013
Cronbach's Alpha indicates 0.861 meaning the data is reliable. Equally, KMO at 0.787 is an indication that the sample size is adequate; hence it is possible to derive logical conclusions from the analysis of variables under consideration.
The general data loadings are as shown in table 1.2; three components are essential for the analysis and can be interpreted into the following three categories namely; Integration and project management indicators, project performance management and value engineering. Category one has a greater variance that can be explained hence the eight variables are critical.
Table 1.3 shows that three components were extracted which can be renamed project management performance factor as component one; project execution efficiency as component two and value engineering as component three. The seven most important variables include: project information management, project scope management, project cost, project quality management, project integration management, project risk management and project time management.

Table 1.3: Clustering the factors by the component matrix

	Component		
	1	2	3
Project Integration Management Factor	.648		
Project Scope Management Factor	.789		
Project Time Management Factor	.618	-.547	
Project Cost Management Factor	.767		
Project Quality Management Factor	.728	-.387	
Project Human Resource Management Factor	.262		
Project Information Management Factor	.839		
Project Risk Management Factor	.618		-.364
Project Performance Management Factor	.585	.653	
Construction Site Management Factor	.441	.640	.332
Value Engineering Factor	.072		.872

Source: Field survey 2013
From table 1.3 project information management, project scope management, project cost management, project time management, project quality management, project risk management, project integration management and project human resource management are confirmed as key indicators. However, it should be noted that project integration and project information management are not consistent in loading.

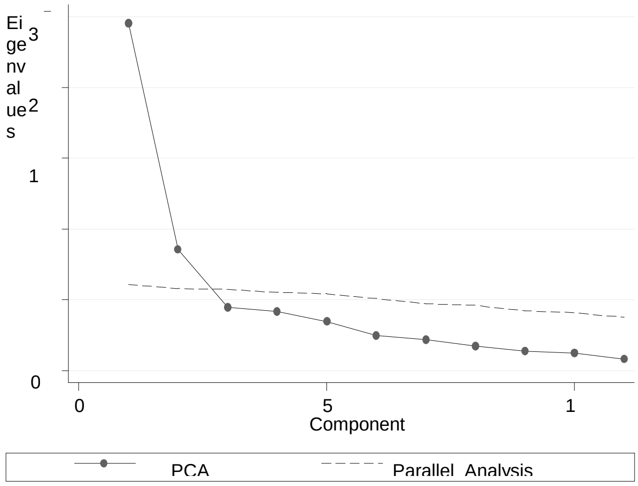

Figure 1.1: Key management factors for project management

Source: Field survey 2013
The parallel analysis from figure 1.1 indicates that there are at least two components that should be retained. This is because the dashed line for parallel analysis in the graph crosses the solid PCA line before reaching the third component.
Table 1.4 reveals that all the project management factors are important (Alpha > 0.8), and the deletion of any item indicates almost similar Cronbach's Alpha. Henceforth all the variables under analysis are critical for study and they have to be considered; for any reduction to take place then other procedures and or methods have to be used.

Table 1.4.: Item-Total Statistics for Key management factors for project management

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Project Integration Management Factor	42.5556	28.363	.495	.493	.854
Project Scope Management Factor	42.3535	27.777	.723	.628	.839
Project Time Management Factor	42.1010	30.578	.382	.513	.860
Project Cost Management Factor	42.0000	30.101	.634	.657	.851
Project Quality Management Factor	42.0909	29.982	.532	.609	.853
Project Human Resource Management Factor	42.6970	27.212	.608	.598	.846
Project Information Management Factor	42.7879	25.708	.753	.670	.833

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Project Risk Management Factor	42.6970	27.698	.550	.473	.850
Project Performance Management Factor	42.7475	26.298	.607	.579	.846
Value Engineering Factor	42.8283	27.244	.539	.448	.852
Construction Site Management Factor	42.5152	28.163	.451	.464	.859

Source: Field survey 2013

B. Consultants' Views On Project Management

Respondents were asked to express their opinions on the current status of project management in Kenya towards effective and efficient execution of projects. Some of the emerging views were as follows:-

(i) That the roles of project managers should be clearly defined and certification of project managers is required to ensure quality of project management in ensuring projects execution efficiency in Kenya.

(ii) That with even unstructured and minimal application of project management to construction projects has resulted in effective and efficient execution of construction projects. If a more structured form with measures is adopted then the results will be tremendous.

(iii) That there is need for early inclusion of project managers in construction projects execution.

(iv) That there should be building information modeling systems as an approach to modern construction and design should be introduced to project managers early so as to achieve quality, cost and timely projects execution

(v) That the role of project management in construction projects is gradually getting indispensible as projects get more complex and bigger.

(vi) That project management provides a useful way to enable clients to better interact with financial institutions, authorities, consultants and contractors especially on large projects and for clients who may be green to construction.

(vii) That there is need for regulation in the practice of project management. Currently everybody is calling himself/herself a project manager without requisite qualifications and evaluation criteria.

(viii) That for efficiency and effectiveness as a result of project management in Kenya; there is need for all stakeholders to adopt it, must appreciate it and practice it. The design team and employers particularly must do so; so that a lot of gaps in design and execution are filled.

(ix) That project management is not properly regulated; therefore, usually practiced by unprofessional persons aiming for a quick profit.

(x) That architects have refused to embrace it.

(xi) That currently construction project management as practiced in the industry appears to be informal and unstructured being performed by professionals with no or little formal training in the discipline. As a result projects and clients rarely receive the optimal benefits touted by the practitioners.

(xii) That project managers are just taking the role of coordinating and delivering project from the Architects and Engineers. The consultants are generally reluctant to take on a project manager because they relinquish control. While clients see them as another fee expense yet a good project manager can really help a project to actualize the set objectives.

(xiii) That the role of project management should be transferred from present to future meaning a qualified person with project management skills should be at the top of the projects; managing specifically the scope and time since cost is already taken care of.

(xiv) That currently the concept of project management has not been fully embraced. However with proper structuring of project management can give good results for both the client and the consultant, this will also require proper definition of roles to avoid overlapping roles of individual consultants.

C. Comparing The Two Sets Of Project Management Factors

The testing equations were formulated as below;

H_0 :

$$PMM = PT + PC + PQ \ldots\ldots\ldots\ \ldots\ldots\ldots (1)$$

H_1 :

$$PMM = PT + PC + PQ + PS + PH + PP \ .(2)$$

Table 1.5: Hypothesis Testing of Between-Subjects Effects for the traditional factors of project management

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	55.724[a]	10	5.572	3.508	.000
Intercept	381.744	1	381.744	240.287	.000
Pro_time_mangment	3.530	2	1.765	1.111	.331
Pro_cost_mangment	2.516	2	1.258	.792	.454
Pro_qm_factor	10.124	2	5.062	3.186	.043
Corrected Total	519.624	302			

Dependent Variable:Name of the Profession a. R Squared = .107 (Adjusted R Squared = .077)

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Table 1.6: Hypothesis Testing of Between-Subjects Effects for the proposed factors of project management

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	289.730[a]	41	7.067	8.089	.000
Intercept	576.356	1	576.356	659.715	.000
Pro_time_mangment	1.333	1	1.333	1.526	.218
Pro_cost_mangment	.000	0	.	.	.
Pro_qm_factor	39.734	2	19.867	22.741	.000
Pro_hr_managmnt	2.064	3	.688	.788	.502
Pro_sco_managemnt	.045	2	.023	.026	.974
Pro_perfoma_managmnt	29.274	4	7.318	8.377	.000
Corrected Total	515.130	299			

Dependent Variable:Name of the Profession a. R Squared = .562 (Adjusted R Squared = .493)

Source: Field survey 2013

Where:

PMM is the Overall Project Management evaluation Model, PT is Project Time PC is the Project Cost, PQ is the Project Quality, PS is the Project Scope, PH is the Project Human Resource and PP Project Performance

The comparison of the two testing tables as shown above using the f-values indicate that the f-value for table 1.5 model 1 (which compares time, cost and quality) is 3.508. This value is relatively low than that of the table 1.6 model (compares time, cost, quality, scope, human resource and performance) which is 8.089. The same can be compared using the adjusted r-squared values. For project cost under table 1.6 is a Z-report implying marginal errors.

Consequently, because $f_{312(6)}cal$ = 8.089 is greater than $f_{312(3)}cal$ = 3.508 (both being greater than) the tabulated f-values; we conclude that the corrected model of the six project management factors implied by the alternate hypothesis is more efficient and effective to be applied in the construction industry in Kenya.

The F table tabulated shows $f_{312(6)}tab$ = 2.0985 which is less than (<) the $f_{312(6)}cal$ = 8.089. Similarly the $f_{312(3)}tab$ = 2.6049 which is less than (<) the $f_{312(3)}cal$ = 3.508. Therefore, we reject traditional measures of cost, quality and time as appropriate project management factors but instead support the six variables comprising of cost, quality, time, scope, human resources and project performance as the most appropriate project management factors for Kenya at a confidence level of 95%.

VII. CONCLUSION

Project management variables for Kenya should comprise of the six variables of cost, quality, time, scope, human resources and project performance. These variables can then be monitored is leading measures instead of lagging measures monitored at regular intervals to ensure efficiency in the construction industry in Kenya.

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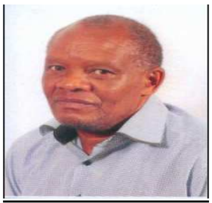

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